Controls on Methane Emissions
from Vegetated Wetlands:
Substrate, Oxidation, and Transport

Progress Report

Principal Investigator: Dr. Gary J. Whiting
Department of Biology, Chemistry, and Environmental Sciences

Period: June 1,1995 through December 31,1995

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Progress Report

P.I. Gary J. Whiting

Period Covered: January 1 - December 31, 1995

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CHRISTOPHER NEWPORT

cnu

UNIVERSITY

November 30, 1995

Dr. Diane Wickland
Code YSE
NASA Headquarters
Washington, DC 20546

Dear Dr. Wickland,

The following is a 1995 status report and future plans for our work on NAGW-3736:

● 2 papers accepted for publication in a special issue of Aquatic Botany. Copies of both are enclosed.

● We finished our second field season (May thru October) with all sampling designs accomplished as planned.

The accomplishments to date:
- Plots of 1994 methane and CO_2 exchange data are depicted in the attached figures. Preliminary analyses of the data do not indicate a significant difference between fertilized plots and control sites. This manipulation continued for 1995 and comparisons will continue. It is interesting that the methane peak lagged the CO_2 exchange peak by approximately 1 month. This may be the related to substrate utilization or changes in root exudation rates during the latter part of the season. We are considering developing some new experiments for 1997 field season that will help us define the linkage between NEP and CH_4 production and emission.
- A small tower was deployed that monitored air and soil temperatures, relative humidity and light levels every 5 mins. over the length of the sampling season. This data will be used to calculate a better estimate the total exchange over the season and help us examine the temperature and CH_4 emission/production relationships.
-Approximately every 2 to 3 weeks between May 10 and Oct. 28, 6 control and 14 experimentally manipulated plots were measured for methane emission and net primary production in the research fen. The 1995 carbon dioxide exchange data and CH_4 emissions are now being analyzed.
-Belowground pools of methane were determined in 18 positions within the fen every 3 to 4 weeks. We also extended our measurements to the other peatland systems (rich marsh, poor fen, bog).
-Both methane production and oxidation potential was measured monthly on peat samples incubated in the laboratory. We expanded this to include temperature dependence affects.
- As found in 1994, seasonal in situ measurements of methane oxidation indicated that oxidation was significant during the early spring but was near zero for the mid-summer to the end of the growing season.

For the next funding period (Period 4), I request funding of $95,000.00 starting 1/1/96 through 12/31/96. Separate budget sheet enclosed. Also enclosed are the varied certificates.

Plans for next year include: 1) continued seasonal sampling within the control and manipulated sites and 2) a newly designed isotope tracer study to examine the linkages between net primary production and production and emission of methane. Over the next few months, we will continue to analyze the data collected this past year.

A few budget changes are highlighted. I am shifting part of the P.I. salary support from the 9 months school year into summer support for the P.I. and into technician support. Effectively, this spring semester, the grant will support approximately 1 mo. of PI salary, 1 mo. of salary during the summer, and 2 months of effort during the fall. Similar to last year, we successfully incorporated both graduate and undergraduate students during the seasonal sampling.

Thank you for your time.

Sincerely,

Gary J. Whiting

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Control Sites
(1994)

CN1
CN2
CN3
CN4
CN5
CN6

CH$_4$ Emission (mg C-CH$_4$ m^{-2}d^{-1})

1000
900
800
700
600
500
400
300
200
100
0

Time (month)

5   6   7   8   9   10   11   12

Control Sites
(1994)

CN1
CN2
CN3
CN4
CN5
CN6

CO$_2$ Exchange (g C- CO$_2$ m^{-2} d^{-1})

14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3

Time (month)

5   6   7   8   9   10   11   12

Fertilized Sites (1994) — CH₄ Emission (mg C-CH₄ m⁻² d⁻¹) vs Time (month). Legend: FU1, FU2, FU3, FU4, FL1, FL2.

Fertilized Sites (1994) — CO₂ Exchange (g C-CO₂ m⁻² d⁻¹) vs Time (month). Legend: FU1, FU2, FU3, FU4, FL1, FL2.